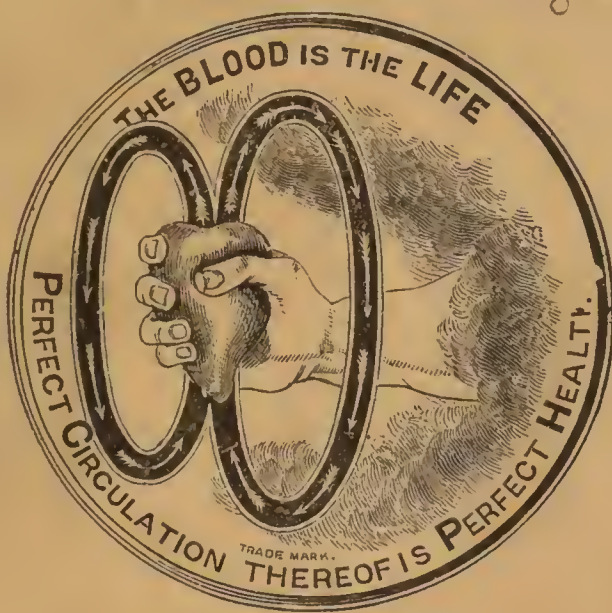


CUMULATIVE EXERCISE

AS A

SYSTEM OF PHYSICAL TRAINING

by
Frank W. Rilly.



NEW-YORK:

THE HEALTH-LIFT COMPANY

46 EAST FOURTEENTH STREET.

1876

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CUMULATIVE EXERCISE



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CUMULATIVE EXERCISE

A SCIENTIFIC APPLICATION OF THE

LAWS OF MUSCULAR CONTRACTION

TO

PHYSICAL CULTURE

WITH SPECIAL REFERENCE TO ITS INFLUENCE UPON THE
CIRCULATION OF THE BLOOD AND THE
PROCESSES OF NUTRITION

BEING THE BASIS OF THE SO-CALLED "HEALTH-LIFT" OR "LIFTING CURE"

BY

FRANK W. REILLY, M. D.



NEW YORK:

THE HEALTH-LIFT COMPANY

NO 46 EAST FOURTEENTH ST,

1876

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PHYSICAL Exercise, as a means of restoring and preserving health, has been, for nearly three thousand years, justly considered one of the most important elements of hygiene. Indeed, Hippocrates, "the father of medicine," epitomizing the wisdom of the ages, makes the essence of health to consist in *temperance* and *Exercise*.*

Another scarce less illustrious teacher summed up a long life of observation in this sentence: I know not which is the more indispensable for the support of the frame—*food* or *Exercise*. Plato, placing gymnastics and medicine at the head of all the arts that minister to our bodily welfare, assigns to gymnastics the pre-eminence over medicine, since the former renders the latter needless. And a famous statesman of our own day tersely says: The essence of education is the education of the body. * * * To render his body strong and supple is the first duty of man. He should develop

* It is quite plain from the context, that Hippocrates, by temperance, meant such an amount of food as would balance, and neither exceed nor fall short of, the Exercise.—[PARKES' *Pract. Hygiene*, p. 509.

and completely master the whole muscular system.

* * * It is the first duty of a State to attend to the frame and health of the subject. * * * The fate of a nation will ultimately depend upon the strength and health of the population.*

Still more to the purpose, in this age of intellectual activity, when brain is daily made to do more and more, and the body, through the multiplicity of mechanical contrivances and the utilization of natural forces, does less and less, still more pertinent is the counsel of Socrates to the young Epigenes: For in all human affairs the body must bear its part; and in all undertakings required of the body, it is of paramount importance that the body should be as highly developed as possible. Moreover, in that wherein you imagine the body participates least of all, viz: in thinking, who knows not that many fail grievously from an ill condition of the body. And oftentimes obliviousness, imbecility, petulance, and insanity, from the same cause, assail the mind, even to the extent of obliterating all acquired knowledge.†

Such counsel and warning are of no one age or race; all literature teems with them. But in no age and with no race has the necessity for such warning and advice been more imperative than it is with the American and to-day. In no other age,

* Disraeli.

† Xenophon's *Memorabilia*.

with no other race, has life been so intense, exhaustive, destructive of brain and nerve, as in this New World, and in this latter half of the XIXth Century.

But what time has the average professional or business man, in any of our great cities, to spare for mere bodily culture, for the gymnasium, the oar, or the saddle? He does well, as times go, if, by working his brain at high-pressure speed twelve, fourteen, sixteen hours a day, he manages to hold his own with his restless, eager, ambitious competitors. Two hours taken from this for the gymnasium! Why, stocks might go up an eighth, or gold go down a quarter, and he not know it until a fortune had been lost or won. Some one might, in those two hours, have "seen" the proper man and got through "the little bill" he'd been fighting all the session. The minister must be on the alert, or a rival draws off his congregation; the lawyer, or an injunction ruins his client; the editor, or be "scooped" by a Grand Duke's untimely arrival, a Stanley expedition, an "Amateur Lunatic," or a "Ring fraud." And so, with the throttle-valve wide open, a fifty-six on the safety-valve, and the furnace-fires fed with greased lightning, the frail hull rushes, meteor-like, along the stream of life, each extra revolution of the throbbing engine wrenching and straining beams and planks, until it must, perforce, be hauled off for repairs.

How many men not only wreck their hulls by neglecting proper care of them, but ruin their engines, the statistics of insane asylums and of diseases of the brain and nervous system may faintly show. Our physical decadence has become the theme of the satirist, the philosopher, and the physician; and it may well give rise to the gravest apprehensions for our national future.

Fortunately, as a general rule in this world, demand rarely exists, for any length of time, without begetting supply. And the demand, which was daily becoming more and more strenuous, for a mode of Physical Exercise combining maximum results with a minimum outlay of time, of nerve-force, of convenience, it is not too much to say—if we may rely on the testimony of thousands of medical men, gymnasts, and average professional and business men—has been fully met in the system of Cumulative Exercise—a system which, as we propose to show by citations from the highest authorities in physiology and physical training, fulfills all the requirements of a perfect, symmetrical, scientific bodily education, by an expenditure of time which, even in this crowded, busy life, may be spared by the busiest—namely, *Ten Minutes Once a Day.*

THE PHYSIOLOGY OF EXERCISE

ONE of the characteristics of this age, in which “knowledge—it excites prejudices to call it science—is advancing as irresistibly, as majestically, as remorselessly as the ocean moves in upon the shore,”* is that the average mind no longer cares to merely know that a thing *is* done, but demands to know *how* it is done. The age is affected with an epidemic of “want-to-know-you-know.”

It no longer suffices that a dogmatic enunciation of results be given, even by the most eminent. The symbol of To-day is the interrogation point, and its legend should be the salutation of the Klamath Indian — “How ? !”

How does Exercise affect the circulation of the blood—*how* promote nutrition—*how* preserve health—*how* ward off disease ?

We make no apology for adopting the answers to these queries (with the slightest possible condensation) from MACLAREN’S *Physical Education*,† a work which the highest authority on hygiene‡

* *The Poet at the Breakfast Table.*

† *A System of Physical Education, Theoretical and Practical.* By ARCHIBALD MACLAREN. The Gymnasium, Oxford, 1869.

‡ EDMUND A. PARKES, M. D., F. R. S., etc., etc., in his *Manual of Practical Hygiene*, p. 389.

says "should be in the hands of every one"; and whose terse and lucid *résumé* of the physiology of Exercise could hardly be improved upon.

Our material frame is composed of innumerable atoms, and each separate and individual atom has its birth, life, and death, and then its removal from the "place of the living." Thus there is going on a continuous process of decay and death among the individual atoms which make up each tissue. Each atom preserves its vitality for a limited space only, is then separated from the tissue of which it has formed a part, and is resolved into its inorganic elements, to be in due course eliminated from the body by the organs of excretion. These processes are greatly influenced by the activity of the bodily functions. Every operation of the muscles or nerves involves the disintegration and death of a certain part of their substance. We cannot lift a finger, we cannot perform the slightest movement, without causing a change in certain of the atoms which compose the muscles executing the movement, in those of the nerves conveying the stimulus which directed them to contract, and in those composing the nerve centres in which the stimulus originates; and this change involves their decay and death.

The loss, then, of the body, and of each part of the body, being in relation to its activity, a second process is necessary to replace the loss, otherwise it

would rapidly diminish in size and strength, and life itself would shortly cease. This reparative process is performed by the nutritive system, the organs of which convert our food into blood—liquid flesh (*chair coulante*) as it has been called—which in itself contains, and in its never-ending circulation bears to each tissue, the material for the replacement of all waste and for the building up of all additions. And as this material is borne along through channels permeating every part of the organism, each part, by a law incomprehensible but unerring, selects from it and appropriates that particular pabulum which is fit for its special use, and that only. At every point of the human body is this law in unceasing operation—activity, a loss of vital power, disintegration, decay and removal—to be met by a replacement of substance and a renewal of vital power. And as the disintegration of any part is hastened by its activity, so by an equally unerring law is the flow of blood, bearing the renewing material, increased in that part; and again, by a law equally unerring and ever operative, the worn-out particles are cast into this current in its backward course, and conveyed to organs whose function it is to eliminate them from the body. During the period of growth, and, within certain limits, until the full attainable physical capacity of the individual has been reached, the new will

ever exceed the old, so that a gradual increase in bulk and power will be obtained. And the strength of the body as a whole, and of each part of the body individually, is in relation to the frequency with which these atoms are changed; and the strength of the body as a whole, and of each part of the body individually, is thus ever in relation to its *newness*.

Exercise, then, is the chief agent in the destruction of the tissues; but it is also the chief agent in their renovation, inasmuch as it quickens the circulation of the blood from which the whole body derives its nourishment, the tide on which is brought up all fresh material, and on which is borne away all that is effete and useless—brought up and borne away most rapidly in those parts which are being most rapidly employed, where disintegration is most rapidly taking place.

Another most important feature of Exercise is its effect on respiration or breathing—important, because with every breath a load of the wasted material of the body is given up by the blood in the form of carbonic acid, etc., and its place supplied by life-giving oxygen from the surrounding atmosphere. To make this all-important process plainer, let us glance at the mechanical action of breathing.

On the requirement for air, the *besoin de respirer*,

being experienced, the inspiratory muscles contract and lift the osseous framework of the chest, thus increasing its diameter from side to side and from back to front; while, at the same time, the large arched muscle (the diaphragm) forming the convex floor of the cavity also contracts, and in doing so its fibres are straightened, and its elevated surface is consequently depressed, increasing the diameter of the chest from above downwards. As this takes place the air rushes down the trachea, or windpipe, and passes at once into the lungs, which it fills out in every direction. But all muscular action is intermittent. The contractile effort accomplished, the reaction begins; the inspiratory muscles relax, and a second set of muscles, the expiratory, antagonizing those which lifted the walls of the cavity, now contract; and the muscles of the abdomen, antagonizing the diaphragm, also contract, and the air is expelled by the aperture through which it entered. This is, in outline, the process of ordinary effortless breathing; but in the forced respiration of energetic Exercise, and especially of Exercise calling into action the muscles of the upper limbs and the upper region of the trunk, many of the voluntary muscles may also be employed in the process of respiration.

This distinction of "voluntary muscles" suggests a word as to the *involuntary* muscles, of which

those of respiration and of circulation are most important. The involuntary muscles are prompted to action each by its proper stimulus, and the heart is stimulated by the presence and augmentation of blood within its cavities. Thus, the instant that any act of Exercise begins, a considerable number of voluntary muscles are put into rapid employment. The contractile action of these muscles impels the blood in their veins onwards towards the heart, venous blood being greatly dependent on muscular action for its circulation; and the heart, stimulated by its presence, energetically contracts, ejecting its contents, and the blood is flushed along the pulmonary artery and distributed throughout its ramifications in the lungs. As the Exercise continues, wave on wave comes up from the heart, each driving before it its predecessor: out of the lungs, along the pulmonary veins, back to the heart, where it is again rapidly admitted and as rapidly ejected; for the heart is a double organ, performing the double office of propelling the blood through two distinct channels of circulation—through the one for its aëration in the lungs; through the other, when so aërated, for the nourishment of the whole body. Out of the heart then it is again ejected, out by the great trunk arteries, and along their innumerable branches, to complete the round of the systemic circulation. But neither heart nor

lungs, nor vein nor artery, throughout the double circulation, is a passive agent in its progress; for though the heart is the great agent of propulsion, the whole circulatory channels possess a certain amount of contractile power, and are endowed with a degree of elasticity, and may in fact, in this respect, be regarded as hollow muscles actively engaged in regulating the moving current within them; and their health and strength and functional ability are promoted by the same agencies, as they are subject to the same laws, as those which influence the condition of the rest of the body.

On these two powers, muscular and respiratory, depends the ability to perform all bodily Exercise. The first involves the contractile force of the voluntary muscles employed; the second is more complicated, involving the contractile force of the heart, the condition of the lungs to perform their function, the size and shape of the chamber in which these organs are contained, and the contractile force of the respiratory muscles, voluntary and involuntary.

Such, in brief, is Exercise—such the ends which it accomplishes, and such the manner of their accomplishment: namely, the destruction of the tissues, the hastening of the decay and death of every part coming within its influence; but also the speedy removal of all waste, and the hastening forward of

fresh material for its replacement; and in doing this it attains three distinct but co-relative results:

I. It increases the size and power of the voluntary muscles employed.

II. It increases the functional capacity of the involuntary muscles employed.

III. It promotes the health and strength of the whole body by increasing respiration and improving the circulation.

SYSTEMS OF EXERCISE

THE glory of a young man is his strength. This is the key-note of almost all systems of physical training. For, notwithstanding those respectable old gentlemen, Herodicus, Hippocrates, Galen, and the rest, without some reference to whom no essay on gymnastics, however crude, could by any possibility be written; notwithstanding their practice and teaching of medical or sanative Exercises, the gymnasium, having its origin in the necessities of a time when physical strength and endurance were among the highest qualities of the citizen, has continued to flourish through our innate respect and admiration for those qualities—hereditary savage instincts out of which we have not yet developed. And though the gymnasium of modern times is but a feeble representative of the ancient palæstra, yet within a dozen years one of its most intelligent supporters sounds the old-time cry in a modern phrase: *Strength is Health*.

As an illustration of the results of the empirical, but time-honored, modes of training of the gymnasium, based on this proposition, let us take its author himself, Dr. GEORGE B. WINDSHIP, of

Boston. A puny and diminutive youth, the subject of intense nervousness, headache, indigestion, rush of blood to the head, and a weak circulation, he was driven to the cultivation of his "muscle" by the petty tyranny of one of his college-mates,—making, on one occasion, after unusual abuse, the following promise to a sympathizing chum: "Wait two years, and I promise you I will either make my tormentor apologize, or give him such a thrashing as he will remember for the rest of his life." Tardy revenge; but young WINDSHIP was as sure as he was slow, and at the end of the two years, with broadened shoulders and developed muscles, the young athlete sought his old enemy, and—received his apology. In his *Autobiographical Sketches of a Strength-Seeker* he says:

"I have only to add that we parted without a collision, and that, in my heart, I could not help thanking him for the service he had rendered in inciting me to the regimen which had resulted so beneficially to my health.

"The impetus given to my gymnastic education by the little incident I have just related was continued without abatement through my whole college life. Gradually I acquired the reputation of being the strongest man in my class. I discovered that, with every day's development of my strength, there was an increase of my ability to resist and

overcome all fleshly ailments, pains and infirmities ; a discovery which subsequent experience has so amply confirmed, that, if I were called on to condense the proposition which sums it up into a formula, it would be in these words: *Strength is Health.*"

Notwithstanding his reputation as "the strongest man in his class," WINDSHIP found that, with the fullest and most severe training the gymnasium afforded, he was unsymmetrically developed ; being, as he says, "perilously weak in the sides, between the shoulders, and at the back of the head"—a discovery that thousands had made before him ; but these thousands, having eyes, saw not wherein the ordinary gymnastic systems fell short.

The primary and vital defect of ordinary gymnastics is that they train the extremities while they neglect the trunk. They produce ponderous masses of muscle in arms or legs—rarely in both of the same subject—but ignore the loins, abdomen, and trunk in general. They develop "magnificent shells" of muscle on the surface, but draw away vitality and power from the interior. To epitomize the matter: *The gymnasium strengthens the extreme links of the chain, but leaves the centre to rust and weakness.*

As a chain is no stronger than its weakest link, so the body is no healthier than its weakest part;

and if *Strength is Health* the gymnasium fails as a health-agency in neglecting the citadel itself—the body—while strengthening the outworks—the arms and legs. And even this defective training, with its unsymmetrical development, is only attainable through an expenditure of time which renders it impracticable for the great majority.

Next in order to the gymnasium comes Baron LING'S system of Movement Cure, which consists, essentially, of the passive and active use of local muscles, under the advice and care of a physician, who prescribes the *dose of Exercise* in each individual case. This is of inestimable value in a large class of diseases, for which no other form of Exercise is at all available; and in its accuracy of prescription it avoids one grave objection to the gymnasium.

These two modes of Exercise embraced all the systems of which anything was known until within the past few years. It is true there have been, in this country, various modifications of the gymnasium, under various titles—as Free Gymnastics, Musical Gymnastics, Calisthenics, etc. But they are all open to the objections above noted, of training the limbs at the expense of the body (a training which, from its unsymmetrical character, strengthens the strong muscles, but neglects the weak, and so is fraught with danger); and of consuming time

in throwing bean-bags, running for pins, or swaying wands to soft music, which no useful member of the community can afford.

To these two objections, of imperfect development and of great outlay of time, may be added a third, which, if the ordinary gymnastic system were open to no other, would be a fatal one, namely: that there is no mode of adjusting, with any practical accuracy, its exercises to the varying conditions and requirements of its patrons. The strong and the weak, the stripling and the giant, are turned loose amongst a wilderness of apparatus, and the sole guide for their training is, generally, their own caprice, or discretion, occasionally the supervision of a teacher who, not unfrequently, has reversed in himself, the condition of his pupils,—that is, developed by disproportionate use, his muscles, at the expense of his brain. A spirit of rivalry and emulation continually urges the pupil toward an excess which is often as disastrous as the condition he is seeking to remedy; *work* is substituted for Exercise, another outlet for vitality is established, by which the life forces are directed to the exterior at the expense of the interior, and with the ability to “put up” the 156-lb. dumb-bell, or to lift the body by the little finger, come, not rarely also, the seeds of grave disease. As Virgil hath it, “by being cured he grows worse,” and premature decay, and

even death may be the result of such injudicious and misdirected training. The records of gymnastic classes, and the history of men who devote themselves to mere strength culture—the whole race of pugilists, rowing men, and athletes generally—abound in illustrations of this danger. Dr. HOLMES says it is notorious “that athletes are liable to become phthisical,” and cites the death by consumption, of Chambers, the rowing champion of England; Sayers, the pugilist, not long after winning a prize fight; Charles Freeman, “the American Giant;” Joseph Hailes, “the Spider”—all noted for their strength.* Dr. HOPE, MACLAREN,

*It is not, of course, pretended that the notoriously short lives, and not infrequent sudden deaths of this class, are due solely to the character of their system of training. When the oarsman, Renforth's, death during a race, was made the text for a general philippic by the Press against physical training, the writer took occasion to show the injustice of ascribing all the evil to the training itself; and attempted, in the following letter, to point out the other factor in the problem :

ATHLETICISM AGAIN.—FURTHER DISCUSSION OF THE SUBJECT OF SPASMODIC AND OVERTAXED PHYSICAL EXERCISE.

To the Editor of The Times :

It doesn't seem to me that your correspondent, under the caption “Is Rowing Conducive to Health?” in your issue of this morning, gets at the root of the matter much more successfully than Wilkie Collins himself, or the writer of the article to which he, Mr. Johnson, replies.

In the article referred to, the important point is stated, it is true, but only incidentally; while the tenor of the article, as a whole, suggests that “thorough training and high muscular development” do not “constitute the best possible physical condition,”—a proposition, to say the least, not yet proven.

But it is proven, and beyond dispute, that, as your editorial writer says in his concluding sentence, “the lesson taught by both is, that whether or not the athleticism of the period develops the brutal side of man, as is claimed by Mr. Wilkie Collins, its hygienic results are far from satisfactory.”

What does “the athleticism of the period” consist of? A few weeks or months of “thorough training and high muscular development,” during which the body

SKEY, the editor of *The Lancet*, and other eminent authorities, have pointed out these evils, unmistakably, and agree that muscular training, or Exercise, should be based upon scientific principles, rather than the crude dogmas of blind experience; that the stimulus of emulation and pluck, by which an unsymmetrical muscular development is overtaxed, is fraught with danger, and should be rigidly excluded from the gymnasium; that the attempt to train the finer fibre of the average man of modern civilization, with its more exquisite nervous organization, and higher mental endowment, to a competition with the coarse, brutal strength of the Middle

is got into "the best possible physical condition:" during which perfect chastity, purity of morals and muscles, a diet rigid to asceticism in the exclusion of everything deleterious to either the nervous or physical system, punctilious regularity of habits, exercise, bathing, sleep, and whatever else physiology can teach or experience warrant, all combine to secure "the best possible physical condition" of the individual for his supreme effort in the race or the ring.

The race or the fight won, or lost, or "sold," as the case may be, and for "perfect chastity" and all the rest of it is substituted the grossest indulgence of every passion and appetite previously controlled and regulated; reckless debauchery to an extent only attainable by men who have reached "the best possible physical condition," as is shown by the ease with which they "knock up" their untrained companions in drinking or in any other excess.

"Geoffrey Delamaine" is drawn from the life, as England well knows. And this man Renforth, at whose death the flags of a city were half-masted, was a typical specimen of the "athleticism of the period"—a period to which Tom Sayers and John C. Heenan belong, stock illustrations of the cant about the evil effects of training. These men, after undergoing probably the severest punishment ever administered in the ring, were so much depressed by their training, that one of them, at the conclusion of the two hours' fight, "leaped over several flights of hurdles, and distanced many of his competitors in the race," whilst the other (Sayers), after his pummeling, including twenty knock-down blows, any one of which would have sent an ordinary untrained man to the hospital for three months, was seen the next day "walking vigorously through the streets of London, evidently in robust health and in excellent spirits." And from that time until death terminated the Englishman's career, and the other became so much alarmed as to check up, their lives were "a round of reckless debauchery." Ren-

Ages, or its modern representatives of the "P. R.," is injurious as to results and degrading in its tendencies.

forth was "a ticket-of-leave man," a blackguard of the lowest character, whom his wealthier congeners, the "Geoffrey Delamaines" of real life, took up for his rowing abilities, backed and fostered him, until he "threw" a race, when he was at once discarded, and for a long while lay around the slums of Newcastle, barefooted, even in winter, and half-starved, until he finally got into a race, won ten pounds for himself, and thence gradually worked his way up again. What his life was, every boating man knows. That his death was not caused by poison, the post-mortem will undoubtedly demonstrate. That it was caused by the exertion of rowing less than one mile in a four-mile race, no oarsman will believe. That his excesses, when off training, acting upon a physical conformation the best calculated for apoplexy—a thick bull neck, too short to tie a string between his chin and collar bones, with immense throbbing carotids—that these excesses had prepared him for the rupture of a blood-vessel in the brain (for such, no doubt, will be found to have caused his death), and that this rupture might have been caused by a moderate degree of excitement, mental or physical, are equally clear. And, finally, that his death from these causes would have occurred at an earlier period if it had not been for his training, is at least highly probable.

The moral of all which is, that not thorough training, but imperfect and intermittent training, which is, it is true, "the training of the period," is injurious and unsatisfactory in its hygienic results: that debauchery and excesses kill, and not temperance, regularity, and all that go to make up thorough training: and that, in short, instead of training fitfully and spasmodically for special efforts, the whole life should be a systematic, judicious, and thorough training.

FRANK W. REILLY, M. D.

The Health-Lift, Chicago, August 30, 1888.

THE HYGIENE OF EXERCISE

“THE strength of the body as a whole, and
“of each part of the body individually, is
“thus ever in relation to its newness.”*

And this *newness* of the body—a literal “newness of life”—is attained only, as has been shown, by proper exercise and use of the several parts of the body. “For the body is one, and hath many
“members, and all the members of that one body,
“being many, are one body. * * * And whether
“one member suffer all the members suffer with it.”

Dr. PARKES† says: A perfect state of health implies that every organ has its due share of exercise. If this is deficient, nutrition suffers, the organ lessens in size, and, eventually, more or less degenerates. If it be excessive, nutrition, at first apparently vigorous, becomes at last abnormal, and in many cases a degeneration occurs which is as complete as that

* *Training: in Theory and Practice*—by ARCHIBALD MACLAREN, is the only really scientific work on the subject with which we are acquainted; and though written as a specialty for the Oxford boat-clubs, states the principles involved so clearly and happily, that we recommend it to any of our readers who care to investigate further the hygiene of Exercise.

† *A Manual of Practical Hygiene*. By EDMUND A. PARKES, M. D., F. R. S., Professor of Military Hygiene in the Army Medical School, etc., etc., London, Eng.—P. 374, *et seq.*

which follows the disuse of an organ. Every organ has its special stimulus which excites its action, and, if the stimulus is perfectly normal as to quality and quantity, perfect health is necessarily the result.

But the term Exercise is usually employed in a narrower sense, and expresses merely the action of the voluntary muscles. This action, though not absolutely essential to the exercise of other organs, is yet highly important, and, indeed, in the long run is really necessary for the perfect exercise of all organs, with, perhaps, the exception of the brain.* For not only the circulation of the blood, but its formation and destruction, are profoundly influenced by the movement of the voluntary muscles. Without this muscular movement, health must inevitably be lost, and it becomes, therefore, important to determine the effects of Exercise, the amount which should be taken, and the consequences of deficiency or excess.

Excessive and badly arranged exertion may lead to congestion of the lungs and even hæmoptysis

* In another place, dwelling upon the effects of Exercise upon the nervous system, Dr. PARKES shows clearly that Exercise is equally necessary to perfect action of the brain. He says: Considering that perfect nutrition is not possible except with bodily activity, we should infer that sufficient Exercise would be necessary for the perfect performance of mental work. Doubtless, Exercise may be pushed to such an extreme as to leave no time for mental cultivation, and this is, perhaps, the explanation of the proverbial stupidity of the athlete. Deficient Exercise causes a heightened sensitiveness of the nervous system, a sort of morbid excitability, and a greater susceptibility to the action of external agencies.—[*Loc. cit.*, p. 377.]

[bleeding from the lungs]. Deficient Exercise, on the other hand, is one of the causes which produce those nutritional alterations in the lungs which we class as tuberculous [consumption].

By Exercise the muscles grow, become harder, and respond more rapidly to volition. Their growth, however, has a limit; and a single muscle, or group of muscles, if exercised to too great an extent, will, after growing to a great size, commence to waste. But this seems not to be the case when all the muscles of the body are exercised, probably because no muscle can then be over-exercised. It seems to be a fact, however, that prolonged exertion, without sufficient rest, damages, to a certain extent, the nutrition of the muscles, and they become soft. As their reparation only takes place during rest, this is easily understood, and, besides, there may be in such cases a general want of nutrition throughout the whole system.

The rules to be drawn from these facts are, that all muscles, and not single groups, should be brought into play, and that periods of Exercise must be alternated, especially in early training, with long intervals of rest.

The appetite largely increases with Exercise, especially for meat and fat, but in a less degree, it would appear, for the carbo-hydrates [starchy and saccharine substances]. Digestion is more perfect,

and possibly a larger development of force is obtained from an equal quantity of food than in a state of rest. Conversely, deficient Exercise lessens both appetite and digestive power. The circulation through the liver is increased by Exercise, and the abdominal circulation is carried on with more vigor.

It is thus seen that a system of Exercise which will bring "all the muscles into play, and not single groups:"

An Exercise in which the exertions are "alternated with intervals of rest:"

And one of such a character as will admit of measuring accurately "the amount which should be taken,"—is the ideal system as a hygienic agency.

CUMULATIVE EXERCISE

ABOUT eighteen years ago Dr. WINDSHIP began a scientific study of Muscular Exercise, with the view of supplementing the defective systems of physical training then in vogue.* As a result of his study and experiment originated what has lately been widely known as the "Lifting Cure" or "Health-Lift," terms which are unfortunate, in conveying an erroneous, if not unfavorable, idea of the character of the Exercise.

In ordinary lifting one generally stoops or bends forward and raises the object to be moved by contracting the flexor (bending or flexing) muscles of the arms; and, indeed, this is characteristic, not only of lifting but of almost all ordinary Exercise, whether gymnastic or other. In doing this the following objections are to be noted: *First*, the body is not in a natural, or the best position to withstand a strain. The spinal column, instead of being erect, in which condition the spinal muscles

* Dr. W's first systematic experiments in lifting were made in August, 1855; but in addition to his four years' gymnastic training he had already given much thought to "the question of the extent to which the human strength can be developed," and had been much chagrined at finding, in a lifting feat in 1854, that "main strength cannot be acquired in the ordinary exercises of the gymnasium."

have least work to do, as it is bent forward throws a strain, proportionate to the weight to be moved, on the attachments of the spinal muscles, mainly in "the small of the back." Hence, strained or sprained backs; frequently, life-long injuries. *Second*, the muscles on the front of the body, particularly those of the abdomen, are relaxed, affording imperfect support to the abdominal organs. This imperfect support, coupled with the downward pressure of the diaphragm when the lifting effort is made, is a common cause of hernia or rupture, and of displacements, etc. *Third*, the bending of the body and the attempt at muscular exertion in such position, frequently cause hemorrhage or bursting of blood-vessels, because the flow of blood through the large vessels is impeded by the pressure of contorted trunk or limbs. *Lastly*, it is to be observed that, as Exercise is valuable according to the amount of muscular tissue employed by it, ordinary lifting (or Exercise) is defective, inasmuch as it uses only a few muscles of limited regions of the body.

There have been three distinct phases of WINDSHIP'S system of Exercise. First: The "Strength is Health" period, in which both WINDSHIP and his earlier followers inculcated the doctrine that the more one "lifted" the healthier he was. This led to the construction and use of apparatus for yoke

or shoulder-lifting, by which immense weights were raised. Except for the training of athletes and as a part of the old gymnastic system, this has died out.

Second: The "Lifting Cure" phase, the special exponents of which proposed the immediate extinction of the Medical Profession, and promised a speedy abolition of all ills, physical, moral, social and political, by the use of their particular apparatus in accordance with their particular code of instructions, which, like the Eleusinian mysteries, secured eternal bliss only to the initiate.

Of its present status we shall speak more in detail, under the title *Cumulative Exercise*,* a title adopted as being free from the charlatanism of the term "Lifting Cure," and as describing a distinguishing characteristic of the system.

In WINDSHIP'S researches he was struck by the number of muscles, not only of the extremities but of the trunk, which were brought into action in *sustaining* a weight suspended from the hands, with the trunk in a perfectly upright position. This

*CUMULATIVE.—Increasing by successive additions.—

[*Worcester.*

Augmenting ; gaining or giving force by successive additions.—

[*Webster.*

From *Cumulo*, to increase or augment ; to render perfect or complete.

[*Ainsworth.*

CUMULATIVE EXERCISE.—A system of exercise in which additional muscles are brought into use successively, by successively increasing the amount of weight or resistance ; a perfect and complete exercise of the entire muscular system.

weight was thrown upon the body by attaching the hands to it with the knees bent, when, by straightening the knees, the weight was gradually taken, through the arms, by the trunk. In this way not only the muscles of the lower extremities and of the arms and shoulders were brought into play, as in ordinary lifting, but the muscles of the whole body were vigorously and equally used in preserving the upright position.

Subsequent experiment taught the value of the law that by Exercise the muscles "respond more rapidly to volition." And this led to dividing the Exercise into a series of *cumulative* efforts. Beginning the day's Exercise with a comparatively moderate exertion, after a brief interval of rest, this is followed by an increase in a given proportion; again an interval of rest followed by an additional increase; a longer interval and, finally, the supreme effort. The preliminary efforts, made by muscles which, from daily use in walking, etc., "respond rapidly to volition,"—in other words, which contract readily—these efforts serve to arouse less used and, consequently, more slowly acting muscles, until all the available muscular strength is systematically aroused and safely exerted.

Thus is fulfilled Dr. PARKES' requirements of a perfect Exercise, viz.: that all muscles, and not single groups, should be brought into play:

That periods of Exercise should be alternated with intervals of rest :

That the amount of Exercise taken be accurately determined.

As a mere gymnastic system this possesses the merit of securing a symmetrical development. The muscles of the loins, abdomen, small of the back,—the supplemental respiratory, and all the spinal muscles are developed as thoroughly as the biceps flexor of the arm or the vastus femoris of the thigh.

This symmetrical development is of such vital importance that, at the risk of being tedious, a few words must be added to what has already been said. Gymnasts generally, by making a specialty of some particular Exercise,—dumb-bells, trapeze or clubs, usually—develop certain regions inordinately, whilst the rest of the body is neglected, so that the common result is to find, after four or five years' faithful use of "the spring-board, horse, vaulting-apparatus, "parallel bars, suspended rings, horizontal and "inclined ladders, pulley-weights, pegs, climbing-rope, trapezoid, etc.," such an inharmonious development of the body, that they "are perilously "weak in the sides, between the shoulders and at "the back of the head,"*—but, usually, in the loins and small of the back ; and athletes, with arms like

* Dr. WINDSHIP in *Autobiographical Sketches of a Strength-Seeker*.

blacksmiths, and chests like the Torso of the Vatican, wrench themselves across the kidneys in efforts that a school-boy might make with impunity. For Cumulative Exercise one is no stronger than his weakest part, whether that be his biceps or his liver ; he can lift, *in a natural position*, calling uniformly on the whole system, only the measure of that weakest part. In ordinary Exercise, he may do much more than this ; by position, favoring and protecting the weak he may make the most of his strong points, and so increase the disparity, the strong growing stronger by use, and the weak growing weaker by disuse ; and the “peril” growing in the same proportion,—for, sooner or later, comes a time when the right position cannot be assumed or is neglected, and the very strength, then, of the strong, is disastrous to the weak spot, and irreparable injury may so be done. Almost every one knows some instance of this, some giant who was the boast of the neighborhood in his youth,—could shoulder a barrel of flour,* fell an ox with his fist, or do some other wonderful feat—a cripple now, or

* “The shouldering of a barrel of flour is a feat, by the way, which many an old inhabitant will tell you that he, or some friend of his, could accomplish in his eighteenth year. Why it should always be among the *res gestæ temporis acti* cannot readily be explained. It is a common belief that any stout truckman can do the thing ; but I have been assured by one of the leading truckmen of Boston, that there are not, probably, three individuals in the city who are equal to the accomplishment.”—

[Dr. WINDSHIP ; *loc. cit.*

prematurely dead, from the exertion of that unsymmetrical strength which had been, literally and figuratively, at once his strength and his weakness.

Being no stronger, for the System of Cumulative Exercise, than his weakest part, it follows that any increase of the strength of an individual, as shown by the heavier weights raised from day to day, is due to a strengthening of the weak muscles, organs and tissues, an approximation to symmetry of development, an actual, tangible increase of working, every-day strength and endurance, the basis of mental and physical health.

Rowing men, club-swingers, pedestrians, and other experts in special gymnastics, who have thoroughly investigated the system, concur in this view.

F. G. WELCH, Professor of Physical Culture in Yale College, calls it "*a thorough pan-athletic system, exercising a greater number of muscles than any other known mode, and possessing the invaluable merit of accuracy of prescription to the requirement of the individual.*"

W. B. CURTIS, Esq., President of the Chicago Athletic Club, himself a typical gymnast, a splendid oarsman, a fast runner, champion high jumper of the New York Athletic Club, the best read man in this country in the literature of athletic pursuits, and the lifter of the heaviest weight on record, gives

it as his opinion, after several years' thorough trial, that "*one can keep in better 'condition' by ten or fifteen minutes' Exercise (according to this system) every other day, than by the usual hour-and-a-half spent in the gymnasium.*"

Col. W. E. VAN WYCK, President of the New York Athletic Club, pronounces the Exercise "*invaluable for strengthening and invigorating the muscles of the trunk, abdomen and loins.*"

H. E. BUERMEYER, Esq., Treasurer of New York Athletic Club, concurs in this opinion, and considers the Exercise "*essential to perfect development.*"

One of the famous "Jim" Montgomery's pupils, a gentleman who habitually swings forty-pound clubs, says that "*while strengthening the muscles of the loins and small of the back, the Exercise does not destroy the elasticity and suppleness of the muscles so essential to graceful club-swinging.*"

The Secretary of the Young Men's Gymnasium of Cincinnati (the largest and best conducted institution of the kind in the country) says, officially, "*the Exercise, simple in itself, is of such a nature that the entire body is called upon simultaneously and systematically—no one set of muscles being too violently exercised while others are entirely unemployed.*"

The ex-Superintendent of the Gymnasium of the Seventh Reg't N. Y. S. G., says that "*by this Exer-*

*“cise a larger number of muscles are safely brought
“into action than I have ever seen by any other
“mode.”*

So much for the gymnasts. But a higher claim is made for Cumulative Exercise than that of simply securing most efficiently and certainly a symmetrical muscular development.

Allusion has already been made to the evils which notoriously follow the ordinary methods of mere strength culture. It has been shown that the inordinate development of superficial muscles—the production of the knobby masses of indurated flesh which it is the delight of the average gymnast to exhibit in season and out of season—is, to the eye of the physiologist, a monstrous deformity, indicative, not of valuable strength, but of a perversion of nutrition, a want of equilibrium as certain to result in weakness of the vital organs, consequent disease and premature death as though the conditions had been reversed, and, by want of Exercise, the muscular function were destroyed, and so apoplexy, paralysis, fatty degeneration, and other disease of the vital organs invited.

It is claimed for Cumulative Exercise that, in addition to its direct effects upon the muscular system, it exerts a profound influence upon the nutrition, functional activity and health of every organ

of the body. That, in short, it is a perfect system of physical training, in that it develops and strengthens—not merely the muscular system, but—the entire *physique*.

This it does, in common with all Exercise, through the agency of muscular contraction upon the circulation of the blood. What that agency is, and its importance, have already been sufficiently explained in the chapter on the *Physiology of Exercise*. And it only remains to point out the radical difference between the repeated contractions of a few muscles, as in walking or in any ordinary Exercise, or even in manual labor, and the contraction of the great bulk of muscle systematically aroused by Cumulative Exercise.

“During Exercise the muscles want blood, and “suck it up like so many sponges.” Not only so, but Exercise—that is, muscular movement or contraction—is only possible by reason of an increased amount of blood in the muscle. This is a condition precedent to the contraction, as truly as steam in the cylinder is a condition precedent to motion of the piston. This increased amount of blood is supplied by an increased activity of the heart; and where muscular contractions are repeated and rapid we have rapid, even tumultuous, heart’s action.

It was soon noticed, however, that in Cumulative

Exercise, although the pulse was accelerated by the first efforts, as in ordinary Exercise, it was uniformly slower, fuller and more equable after the final effort than before beginning the Exercise. The writer has frequently performed the following experiments, both upon himself and others, and always with the same general results:—

The rate of the pulse noted before Exercise (in the writer's case, which will be used for the present illustration), at 68. Lifted five hundred pounds, the pulse rising to 76; rested one minute, then lifted seven hundred and fifty pounds, the pulse rising to 80; rested about two minutes, then lifted nine hundred pounds, pulse 80; rested about three minutes, then lifted one thousand pounds; pulse, three minutes after, *fallen to sixty-two*.

Experiment II. Divided the above aggregate weight, of thirty-one hundred and fifty pounds, into seven weights of four hundred pounds each, and one of three hundred and fifty pounds. Lifted these eight weights in the same aggregate time, about seven-and-a-half minutes. Pulse before lifting, 68; five minutes after lifting eighth weight, 90.

These experiments were tried No. I on one day, No. II on the day following; in the mornings and afternoons of the same days, and sometimes the one, sometimes the other, for several successive days. The results, however, were uniform within a certain

range. In the writer's case, the pulse was reduced on one occasion from its standard of 68 to 57, which is the most marked reduction ever noted—the average range of reduction being from five to eight beats in the minute.

These results were so unlooked for, and their explanation was so obscure, that for a time the experimenter was unable to frame any satisfactory theory to account for them. Finally, by the aid of the sphygmograph (or pulse-tracer), he was enabled to demonstrate the essential difference in the results produced on the heart's action, and the circulation of the blood, by ordinary forms of muscular exertion, and by this system of Cumulative Exercise.

This difference may be summed up, substantially, thus :

I. *Ordinary forms of muscular Exercise increase the rate of the heart's action, but diminish its efficiency*—so that, while the heart may be throbbing violently and laboring to supply the limited number of muscles, generally used, with the necessary amount of blood for their action, the compression of these muscles is not sufficient to send the blood back to the heart by the deeper veins in sufficient quantity to meet this demand ; nor is the contraction of a few muscles sufficiently potent in relieving capillary congestion, which may be offering resistance to the free flow of blood from the arterial

circulation. Hence, while the pulse is made more rapid and often irregular, its volume is either not increased, or is absolutely diminished.

II. *The gradual arousing of the latent muscular strength by overcoming gradually-increased weights or resistances, reduces the rate of the heart's action, but increases its efficiency,*—so that after raising in this graded manner, the heaviest weight one is able to, the heart will be found beating more slowly and regularly, and the pulse increased in volume.

This, then, explains why the so-called “Lifting Cure,” or Health-Lift, produces such beneficial results :—

It explains why ordinary Exercise exhausts—Cumulative Exercise invigorates :—

Why ordinary Exercise makes one pant for breath—Cumulative Exercise makes the breathing deeper and fuller :—

Why ordinary Exercise sets the heart beating like a trip-hammer, the temples throbbing and the chest laboring—Cumulative Exercise makes the same heart work as regularly and efficiently as a steam-engine :—

Why ordinary Exercise leaves a man “shaky” and unfit for anything requiring delicacy and steadiness of “nerve”—Cumulative Exercise tones alike muscle and nerve, so that after one’s heaviest weight

he can write, or paint, or practice with more accuracy than before* :—

And—more valuably than all—Why ordinary Exercise is often unsafe and injurious—Cumulative Exercise rarely, if ever, is; ordinary Exercise generally “costs more than it comes to”—Cumulative Exercise is the most economical of brain and nerve power; ordinary Exercise may do good, if a man is strong enough to stand it—Cumulative Exercise can be graded to the most delicate person. In short, Cumulative Exercise, by its influence on the Blood, which is “flowing flesh,”—which is “the most potent of all remedies,”—which is the “great builder up of the body and scavenger of its waste”—which “is the Life,”—by its influence on the circulation of this wondrous fluid, furnishes a health agent whose value is, as yet, only imperfectly understood and appreciated, even by those who have given it the most study.

* The dynamograph shows very clearly the improvement in the tone of the nervous system produced by the Exercise.

RULES FOR CUMULATIVE EXERCISE

THE system of Cumulative Exercise is so simple that this chapter might almost rival in brevity the famous one on the snakes of Iceland, which, consisting of just six words, informed the reader that "There are no snakes in Iceland."

There *are* rules for Cumulative Exercise, the most important of which are as follows :—

I.—Position.

II.—*Position.*

III.—POSITION.

The amount of weight to be lifted ; the number of lifts into which the amount should be divided ; the duration of rests between the various lifts ; the time of day at which to exercise—all these subjects vary so much with different individuals that it is impossible to do more than lay down certain broad, general principles on which each must frame his own rules.

But the subject of the three rules above given is inflexible, unvarying. *Correct position in lifting is of the first and vital importance.*

The following illustrations show the most common malpositions :

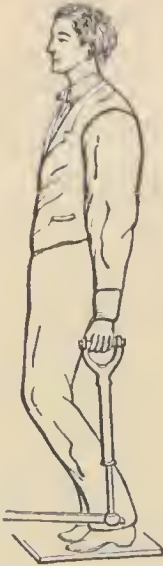


FIG. 1.



FIG. 2.



FIG. 3.

In the first figure the abdomen and hips are too far forward. The line of weight, suspended from the shoulders, falls behind the line of the spinal column, instead of directly through it. The abdominal muscles, instead of being contracted and rigid, are lengthened and strained, whilst the muscles of the spinal column are acting at a fearful disadvantage. In addition to this the bodies of the bones composing the spinal column (the vertebræ), are tipped backward so as to pinch the cartilages between them. In short, the position is as faulty as it well can be, and yet is the one most commonly assumed by beginners when told to stand erect.

The young gentleman in the centre is too modest and retiring. In the effort to avoid the bad

example before him, he has gone to the other extreme; and if he attempts a heavy weight in that position he will have a lame back, as the result of throwing the weight in front of the spine.

If No. 2 is too modest, No. 3 is absolutely shame-faced; and, as he evidently has not energy enough to hurt himself, he may stand as a very “melancholy example” of a position to be studiously avoided.

CORRECT POSITION.

In this outline is seen the correct position. With the body thus posed, the line of weight passes directly down through the curves of the spinal column, through the hip-joint, and, as the knees are gradually straightened, down through the long thigh-bone, the knee-joint, the leg-bones and ankle-joint.



To secure this position, it is necessary to assume, essentially, the attitude of a soldier at “attention” :—

Head up :—

Eyes to the front :—

Shoulders down and back :—

Chest well out, lungs moderately full :—

Arms hanging naturally at the sides :—

Abdomen drawn in :—

Hips directly under the shoulders:—

Feet from five to seven inches apart:—

Toes turned out.

Without changing the position of the rest of the body the knees are now to be bent, so that the body sinks vertically from three to five inches. A good practical instruction, after having secured the correct upright position, is to tell the pupil to *sit down*. In doing this the hips are naturally kept under the shoulders. When the body is lowered sufficiently, by bending the knees outward in the line of the feet as well as forward, the hand-pieces are to be grasped; and the effort to straighten the knees is then to be made slowly, steadily, and continuously, until they are perfectly straight.

This first weight should be about *one-half* the total amount intended for the day's Exercise.

Do not hurry or jerk at the weight.

Do not raise the shoulders or contract the arms.

If the body is pulled out of line, backward or forward, you are straightening the knees too rapidly, and so throwing the weight on the trunk before its muscles are ready for it.

As soon as the knees are fairly straight, begin to bend them again, as slowly, steadily and gradually as they were straightened.

Preserve the position of the head, trunk and arms unchanged until the weight is finally released.

Now sit, or lie down, to allow the muscles to relax as thoroughly as possible for about one minute. Then repeat the process, with about fifty per cent. additional weight. Be sure that your position is all right before beginning to straighten the knees at all. Then make the effort slowly, steadily—not trying to *lift* with the arms or shoulders, but devoting your whole attention to keeping the body erect, your whole energy to steadily straightening the knees.

Rest again about twice as long as at first. Then once more, with an addition of about one-fifth, which will make say 90 per cent. of the total amount you are to lift for your day's Exercise. This comes up a little harder; you don't think you *can* do any more. But you rest again, three or four minutes this time, and then—positively, it didn't seem as heavy as the third! You are breathing at least two buttons deeper than when you began, but not so fast. There is a glow all over the surface, as though you had been subjected to a very gentle electrical current. As you put on your coat you rather wish Samson were around, that you might show him a trick worth two of the gates of Gaza business. Out on the street you regard street-cars contemptuously and the occupants of coupés with compassion. But you're fearfully hungry, and dinner hasn't been so welcome since you

came back from the mountains. Your evening is the most enjoyable you've known for a long time, and, contrary to your wont, you're asleep as soon as your head touches the pillow.

"Rhapsody?" Well, possibly. The President of Knox College, JOHN P. GULLIVER, D. D., says: "If any commendations of Cumulative Exercise seem moderate and cold it must be understood that they were probably written *before* lifting, when the system was sluggish and languid. If any of them seem too enthusiastic and extravagant it can safely be taken for granted that they were written *after* lifting when the blood was coursing freely, the lungs expanding, the stomach digesting, and especially the torpid liver, whose laziness is the cause of so much mortal woe, doing its work in the share of life." OLIVER WENDELL HOLMES says he feels more disposed to take a long walk after four or five lifts than before." MAHLON D. OGDEN says the first effect of lifting was "to enable me to enjoy my evenings, instead of feeling dull and indisposed to any exertion after dinner." CHAS. A. HOYT (Sec. India Rubber Co.) says: "I have frequently, after a severe day's work, forced myself to go through the ten minutes' Exercise when I seemed so exhausted that I could scarce stand up. In ten minutes after, I have been surprised to find myself walking off briskly, frequently whistling, and subse-

“quently spending a pleasant evening; when, with-
 “out the Exercise, I *know* I should have dragged
 “home jaded and worn out, to put food, for which I
 “had no appetite, into a stomach that had no energy,
 “and then pay the penalty.” Hon. GEO. S. HIL-
 LARD, Dean of the Law School, University of
 Boston, says “the Exercise increases the mus-
 “cular force and gives to the whole system a sense
 “of renewed vigor. In general, a man needs such
 “Exercise most when he feels the least inclined to
 “it.” GEO. F. ROOT says: “I cannot hope to say
 “anything emphatic enough to convey the strength
 “of my belief that to this Exercise I owe, not only
 “my present health, but my life.” EDWARD A.
 STANSBURY says “Cumulative Exercise is to other
 “forms of gymnastics as Hyperion to a Satyr—New
 “York to Communipaw—the ocean to a duck-pond
 “—the whole to a part—full, rounded, complete,
 “satisfying—and, like Fred Cozzens’ oxyporian
 “wines, not a head-ache or a back-ache in any
 “quantity of it.”

But why multiply testimony when those who
 merely read without experiment will remain as
 incredulous as ever? An eminent divine writes us,
 while these sheets are preparing for the press: “I
 “must decline both horns of the dilemma you so
 “shrewdly contrive for me. If it were to write what
 “I think people might believe about Cumulative

“Exercise, that would be doing you and your system an injustice, and I could not absolve myself of the sin of ingratitude. But to write what I know and believe myself, from my own experience, that would be simply to shake the confidence of many worthy people either in my judgment or my veracity. So I pray you have me excused.”

In a general way, the rules for proportions of weights in each effort, and the duration of rests between the efforts, may be thus stated :

The first weight of each day's exercise should be about FIFTY per cent. of the amount intended to be raised at the final effort. This should be followed by a rest of about ONE minute. During this rest the weight is increased to about SEVENTY-FIVE per cent. of the final weight. After lifting this, rest about TWO minutes. Increase the weight to NINETY per cent. of final weight; lift and rest about THREE minutes, after which make the supreme effort with the full amount.

For example: One proposes to lift for his last weight, which, of course, should be his heaviest—say 500 pounds. He would begin at

50 per cent. of 500, which is 250 pounds.

REST—one minute. Then lift

75 per cent. of 500, which is . . . 375 pounds.

REST—*two minutes*. Then lift

90 per cent. of 500, which is . . . 450 pounds.

REST—*three minutes*. Then lift the full amount.

And this constitutes the entire exercise for the day.

The next day, begin as before ; first weight, one-half the total amount to be lifted ; second, about three-quarters ; third, about nine-tenths, and finally the entire weight—with the proper intervals of rest between each effort.

At beginning, and until familiar with the foregoing rules, so that the correct position is assumed readily, it is not well to lift to the limit of one's strength. Ladies, if in average health, may begin by lifting from 70 to 100 lbs., and gentlemen from 150 to 300 lbs. When in full practice, the amount may be limited by the strength of the lifter only. Yet, even in this case, Exercise for the mere purpose of exhibiting or testing strength is to be deprecated. It must be remembered that the amount lifted is an accurate measurement of the amount of Exercise taken. It should therefore be varied with circumstances. After a suspension of the Exercise, especially if much time has elapsed since the last lift, one should not attempt at first his maximum weight. He should allow a few days' practice before he tries his old attainments.

Generally, one will increase at the rate of ten pounds every other day in the case of ladies, and

ten pounds every day in the case of gentlemen. But this rule varies with each individual; in some cases the very first day's Exercise produces such an effect upon the circulation that it is necessary to diminish the amount for the next day.

The broad, general rule for the amount of weight is this: *That weight is the most beneficial which is followed by the maximum sense of buoyancy, freshness and invigoration. Any weight which is followed by a sense of fatigue or exhaustion is injurious.*

In some cases four gradations of the weight seem to be insufficient to arouse the muscles fully, and in such, five, or even six, divisions of the weight may be made. The division into four weights, however, is best for by far the greatest number of people.

So, also, as to periods of rest between each lift. The rule above given is based on the majority of cases. But there are some exceptions in which the duration of each rest may be beneficially lengthened, even to double the time.

Exercise should be taken usually in the forenoon about three hours after breakfast. The reason for this involves the physiological law that exercise of function increases the supply of blood in the organ or tissue which is acting—perfect functional activity is impossible, indeed, without a free supply of blood. And as, during this Exercise, the muscles “suck up blood like so many sponges”—drawing

it away from brain, and stomach, and liver, and every other organ—it is clear digestion would be interfered with by lifting too soon after eating. This fact helps explain why diseases arising from, or attended by, internal congestion are so promptly relieved by Cumulative Exercise. About one-half the entire volume of blood in the body (some twenty-eight to thirty pounds) is contained in the muscular system. If this amount be materially increased in the muscles as it is in Cumulative Exercise, it must be at the expense of the volume, for instance, in the brain, which may be causing headache, congestion, mental dullness, etc., or in the portal circulation which may be giving rise to bilious and dyspeptic symptoms.

Lift slowly. This rule is founded on the fact that the muscles do not contract simultaneously, but, as has already been explained, some much more promptly than others—depending on the amount of use; and as the object is to get the greatest possible bulk of muscular tissue into contraction, it is obvious that this can only be done by giving the more slowly acting muscles time to come into play. This also prevents any undue expenditure of nerve-force—economy of which results in the increase of general vitality.

In addition to, and more important than, the increased muscular development, the effects produced

by Cumulative Exercise are, first, general; second, special. The general effects are noticeable in a feeling of buoyancy, freshness, and invigoration immediately following the Exercise. Cold extremities are warmed; headache or sense of fullness in the brain is relieved; the surface of the body tingles; tired muscles feel rested; and a sense of renewed life and vigor follows the improvement of the circulation. This improvement of the circulation is not an acceleration or quickening of it in the usual way, by making the heart beat and throb hurriedly and tumultuously. But the circulation is equalized—that is, the blood is drawn from parts or organs which have too much, and is distributed to those which are suffering for want of it. And this blood, “which is the life,” carries in its current the “great inciter of vital changes,” *oxygen*, whose “presence is the indispensable condition of life.” The contracting muscles absorb this oxygen in a *six-fold* greater proportion than when at rest. And this gives a stimulus and fillip to the animal life similar to that caused by the inhalation of oxygenated air. By it the vital processes are quickened, buoyancy takes the place of depression, the lungs play more freely, and the breathing is deeper and fuller; the muscles are made tense and elastic; the eye is brighter, the brain clearer, the whole system tingles and vibrates with a keener, sharper play of the life forces.

The special effects are noticed in the action excited in parts or organs of the body which are unhealthy or weakened. The more thoroughly circulated blood and the increased amount of oxygen absorbed by the muscular tissue arouse and stimulate the vital changes by which the atoms composing the body are removed and replaced. And as the body is thus rebuilt, under healthier conditions, unhealthy and weakened structures are the seat of unusual activity, until they regain a healthy, normal standard—until, in short, Disease and Weakness are supplanted by Health and Strength.

CUMULATIVE EXERCISE A SYSTEM— NOT A MACHINE

IT seems desirable, in conclusion, to emphasize the fact that Cumulative Exercise, or "The Health-Lift," is not a machine. That it is a system of physical culture for which the apparatus may be of the rudest and simplest character. The only important requirements are a steady resistance, which may be definitely increased or diminished, and such adjustment as will enable the operator to overcome this resistance with the body in a natural, erect position.

Such resistances may be extemporized in a variety of ways. WINDSHIP'S first lifting-apparatus consisted of a hogshead sunk into the ground; in this was a flour-barrel loaded with gravel and stone; a rope, attached to the barrel, terminated in a loop, through which was thrust a piece of a hoe-handle. Standing astride the hoe-handle, which was grasped with one hand before, the other behind the body, the loaded barrel was raised from the bottom of the hogshead by gradually straightening the knees, previously a little flexed. This contrivance, aside from its cumbrousness, was open to the objections that, only by partially unloading the barrel each

day could he begin his exercise with a light weight and gradually increase it; and that, bestriding the hoe-handle caused an awkward twist of the spinal column in what is usually its weakest portion, viz., the lumbar region, or "small of the back."

An improvement on WINDSHIP'S double-barreled machine was devised by a quondam patron of the Chicago "Health-Lift," and which obviated the latter objection. A barrel in the basement was provided with an ash pole on each of two opposite sides; these poles passed through the ceiling into the room above, where they terminated in transverse grasping-pieces. The operator—in this case a lady—stood between the poles with the body erect, and perfectly straight; bent the knees, grasped the handles, and then, by straightening the knees, raised the barrel, previously loaded with a known weight of coal. This process was repeated with gradually-increased weights, until the desired exercise was obtained.*

As before remarked, the essential features of an apparatus for this exercise are a definite resistance,

* Notwithstanding the primitive simplicity of the apparatus, this lady assured the writer that, so far as she could judge, she was as much benefited by its use as she had before been by her daily visit to his rooms, and which she had been obliged to suspend, on account of the time consumed in traveling the six miles there and back. Her ease is given in detail on page 29 of BACK-ACHE: *Its Causes and Cure*; but the above incident is not there mentioned. The barrel and coal were laid aside for the machine spoken of in that record, on account of the trouble involved in adjusting the weights.

and such means of connection with the resistance or weight as will prevent lateral torsion of the spine. But if one proposes to purchase or construct an apparatus, the following points should all be considered :

FIRST.—*The definite weight or resistance.* As the object sought for is the gradual arousing of the latent muscular power, it is obvious that each effort should be limited by the amount of resistance; otherwise, one is in danger of straining or overtaxing such muscles as, by daily use, “respond rapidly to volition.” Hence, the lifting or pulling against varying or indefinite resistances, as a spring, whether it be a spiral or volute steel, or a rubber strap, or the lifting or pulling against an immovable or only slightly yielding resistance, as on platform scales, is inadequate to produce the desired effect. In pulling against springs there is always a sense of incompleteness of action—always something more to be done after one has done his best; while the varying, quivering character of the resistance produces or aggravates muscular and nervous tremor.*

* Much stress has been laid, by parties who make the kind of apparatus used of paramount importance, on the advantage of a spring action by which, at beginning, the lifter is assisted in raising the weight. It is claimed that this “gentle, soft and yielding spring action” “penetrates” and arouses the viscera to new life; that “the interposition between” the lifter’s muscles and the weight, of springs of steel and rubber, with “its all but *flesh-like elasticity*, imparts a feeling of congeniality, that, disarming the tendency to sharp contraction on provocation, elicits an “openness to the ultimate fibre, and unchecked in unison [this is *verba-*

It should also be remarked that the lifting or pulling against only slightly yielding resistances, as on a platform scale, is deficient in the necessary amount of motion; and the gradual tension of the muscles, attained by straightening the knees through three to five inches, is not secured. With both these forms of apparatus, as well as in the jerking, irregular action of a scale-beam, the effect on the circulation is like that produced by ordinary gymnastic feats—that is, the heart's action is made quicker, more irregular and inefficient, while the muscles are tremulous and unsteady. And, instead of the buoyancy and freshness which follow the proper use of a good machine, a sense of fatigue and exhaustion is the usual result of the use of such devices.

“*tim, et literatim, et punctatim* from one of their recent circulars] *the last* “*analysis of supreme effort*, transfers to the nerves and brain in their “rasped surfaces.”—etc., etc., etc.—Which must mean something,—but life is brief, and the amount of time one can devote to the esoteric is limited.

Stripped of all verbiage, the sole object of the spring is to prevent *sudden or abrupt* lifting. This the spring does by its gradual yield. But the muscles should be *educated* to slow, gradual contraction, and this they cannot be in the employment of a spring. Since the primary and essential end aimed at by the system of *Cumulative Exercise* is the making the individual better qualified for every condition of his daily life; and especially, in so doing, making the body a better servant, any apparatus which accustoms the muscles to rely on artificial contrivances to graduate their action unfits them for ordinary use. If the spring system were fully carried out, we should need springs on our boot-straps, on trunks, valises, and all other objects which we desire to move or lift. As this is impracticable, the sensible thing to do is to educate the muscles to gradual, systematic efforts, and so avoid the danger of strain or injury, not simply while exercising, but at all times. And this education can be secured only on lifting apparatus without springs.

SECOND.—*Side-handles, with a proper connection to distribute the weight uniformly on both arms, thus ensuring symmetrical development of both sides of the body.* The centre-lifting, which is the mode practised in gymnasiums in this country forty years ago, is open first, and most importantly, to the objection that it causes a lateral twist of the spinal column, compresses the chest on the side of the forward hand, relaxing the abdominal muscles of that side (favoring the production of hernia or rupture), while the muscles of the other side are unduly strained. In short, the whole position is unnatural, hence dangerous, and unfavorable to the exertion of the full muscular strength, as shown in the fact that 25 per cent. more can be lifted with side-handles than with the contorted spine caused by the centre-rod and cross-bar.* Aside from this, the cross-bar is, to say the least, extremely awkward and inconvenient for ladies' use.

*The advocates of the cross-bar—for, strange to say, there are such,—urge, somewhat irrelevantly, that, in right lateral curvature of the spine, lifting with the right hand habitually forward and *vice versa* for left lateral curvature, will correct the deformity. But this fact, for it is a fact, only strengthens the argument in favor of side-lifting, not only where there is no curvature, but also where curvature does exist.

This is hardly the place to discuss the subject, but its explanation will serve to illustrate one phase of the system of Cumulative Exercise. The proximate cause of lateral spinal curvature is want of equilibrium between the muscles on each side of the spine—the stronger ones bend the spine toward themselves, the weaker ones always lying on the convex side of the curve. The treatment, manifestly, is to strengthen the weak muscles and so restore the equilibrium. It has already been shown that in raising a weight with the body erect, as in this system,

To these two primary qualifications, may be added a—

THIRD.—*Facility of adjustment.* As each day's exercise is begun with one-half the total amount, and is gradually raised (to 75, 90 and finally 100 per cent.), it is a matter of no small moment to be able to readily adjust the varying amounts. If this must be done by handling masses of iron, etc., with the body in a bent or stooping posture, it is a grave defect, and would make the adjustment of the machine out of the question for a lady or an invalid.

Handles or grasping-pieces with inclined surfaces for the palms of the hands, whereby the pressure is thrown on the fleshy cushions of the palm instead of on the bony fingers—so preventing the formation of painful callouses, blisters, corns, &c., and the stiffening of the fingers:—also, *suitable height of apparatus from floor,—range of weight,—portability, compactness and general convenience*, while less important than the first three points, are all worthy consideration.

the muscles of the whole trunk are symmetrically exerted, and the amount of weight, which can be raised, is thus determined by the strength of the weakest part of the body. So that when this is done,—as it is with the arms at the sides, and as it is *not* with one arm in front and the other behind,—the weak muscles are getting a thorough exercise and so being strengthened and developed, whilst the exercise not being, proportionately, so thorough for the strong, the equilibrium between the two is restored, and the curve is obliterated.

And now, after having said so much of the requirements for a good machine, it seems necessary to reiterate:—*No virtue inheres in the machine of itself.* It is only by its intelligent use, according to the principles of the System of Cumulative Exercise, that any more benefit can be obtained from it, no matter how elaborate, than from the crudest appliances of the gymnasium.

It is a *System of Exercise* which the writer has attempted to explain and illustrate—and, as such, it is common property, not the subject of letters-patent, not dependent upon any given apparatus, nothing mysterious or incomprehensible in it or about it.

And although its treatment in these pages is imperfect, disjointed and, very possibly, more or less obscure, it is hoped that this point has been made sufficiently clear to dispel, in some degree, the cloud of charlatanism which has hitherto enveloped it—a cloud arising directly from the efforts of some of its exponents, who have made a given machine an indispensable element of the Exercise.



